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AUTHOR Jaakkola, Ritva; And Others
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ABSTRACT

A study examined the extent to which Finnish horticulture graduates' assessments of their work force competencies differ from those of their teachers and employers. Questionnaires were sent to all 68 plant production graduates of the University of Helsinki's plant production program from 1990-1993, a sample of 38 employers representing agricultural occupations, and 5 Division of Plant Production faculty members. Forty (65%) of the graduates, 25 (66%) of the employers, and all 5 faculty members completed questionnaires. The graduates rated their content-based competencies as quite good; however, many admitted needing better communication, language, and computer skills. Eighty-two percent of the graduates thought the university curriculum placed too much emphasis on transferring facts instead of on developing analytic and problem-solving skills. The employers considered applicants' personal qualities most important when choosing new employees. The employers agreed that the graduates' content-based knowledge was quite good and also considered them fairly competent in languages and mathematics/statistics. Overall, the competencies prized by employers were more comprehensive than the formal qualifications delivered by higher education. Although the faculty members regarded knowledge as very important, they also realized the importance of many other skills in the work force. (Contains 38 references.) (MN)

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WORKFORCE COMPETENCIES OF FINNISH PLANT PRODUCTION GRADUATES AS ASSESSED BY STUDENTS, EMPLOYERS AND FACULTY MEMBERS

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by

Ritva Jaakkola
Tapulikatu 2.A.2
69100 Kannus, FINLAND
Tel. 358-68-871989

Johanna Lasonen
University of Jyväskylä
P.O.Box 35
40351 Jyväskylä, FINLAND
Tel. 358-41-603307. FAX 358-41-603201
Email address: lasonen@piaget.jyu.fi

Eija Pehu
University of Helsinki
Mechelininkatu 25.A.7
00100 Helsinki, FINLAND
Tel. 358-0-444911, FAX 358-0-7085582

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by

Ritva Jaakkola, Johanna Lasonen and Eija Pehu

Synopsis

The study was designed to investigate to what extent horticulture graduates' competencies differ assessed by employers, faculty members and graduates themselves. The questions to be addressed were: (1) What differences exist between self-assessed and employer-assessed competencies among horticulture graduates? (2) What competencies of horticulture graduates are valued by faculty members? Using information gathered with a questionnaire, variables were examined utilizing frequencies and t-test calculations. Findings revealed that the workforce competencies evaluated by employers are more comprehensive than the formal qualifications delivered by higher education. In addition to content-based knowledge in horticulture, the workforce competencies consist of the qualifications, such as high job motivation, positive attitude toward work, aspiration to continuous learning and to applying new knowledge in job tasks, ability to solve marketing problems, teamwork skills, communication skills including speaking and writing in three languages. Implications for improvement of occupational higher education are discussed.

Overview of Workforce Competencies

Plant production research and education will face enormous challenges in the near future. The operational area of agriculture is changing - maximum yield with unlimited inputs is not any more the number-one target, but instead the goal is an economically optimal yield within a sustainable production system (Pehu 1993). According to Pehu the operational area of agriculture will change so profoundly that it will transform the foundations of the research and will also mean big challenges to plant production education.

Agricultural higher education in Finland is both occupational and academic. Occupational higher education can be defined as interdisciplinary, comprehensive and practice-oriented; it has a close relationship to the labour markets. A problem in the university education is that the curricula include a range of disciplines with different research methodologies. Studies may be multidisciplinary, but also fragmented. This kind of education can make it difficult for the students to form their own scientific conceptions. As Järvinen (1990) has remarked, the study method involved easily leads to mere rote learning, and it is not always possible to gain a deeper understanding of the issues dealt with and to think holistically. Ollila (1985a) has found this type of problems among Finnish agricultural graduates, too. Ollila (1985a, 1986) has pointed out that many young agronomists felt that their studies lacked a scientific emphasis as well as such elements as would help them construct their own scientific conceptions and give them tools to analyze real-life problems.

The tension between practical and academic emphasis in university education is traditional. It is not an

issue of equality to what extent the goal of higher education is to prepare students for specific professional jobs in working life and to what extent the goal is to give them opportunities for personal cognitive and social development through scientific thinking. At the moment it is difficult to know what the environment will be like in the future and what kind of problems there will be. Education is always in some kind of imbalance because society is changing so quickly that it is difficult to predict the trends of development. Therefore the students need skills that enable them to learn new things and to acquire new skills and to deal with complexity.

The role of the labour markets is changing. According to Ruhland (1993), these changes stem from intensified international competition, diversification, a faster pace of innovation in production technologies, and new competitive standards. The new situation will demand new job designs, new organizational structures and more skilled workers. As a result new skills will be required, and those skills will be both more in-depth and broader than the current skills (Carnevale, Gainer & Meltzer 1990).

Curriculum review is an ongoing aspect of higher education. There are different views on who should decide about the curriculum. Howard (1989) has summarized that according to one opinion university faculties should determine the curriculum and guard against vocational overemphasis. An opposing view is that universities should be responsive to the changing needs of the market and must, accordingly, prepare students to successfully compete in the new age of technology and global competition (Howard 1989). The latter view holds that the goal is less producing an "educated" person than training him or her to become a productive member of society.

The labour markets have strongly influenced the contents of agricultural education and research so that the vocational dimension of agricultural education has been to some extent emphasized at the expense of the academic dimension. According to Pehu (1992) this has led to a situation where agricultural research is chiefly applied research. In Pehu's (1992) opinion, the development of the domain has been slow, and if there is no progress in basic research there will not be any new agricultural innovations either.

In this study a skill refers to an ability gained by training or learning. Qualifications refer to qualities that include many skills. Skills are the components of competence. Competence consists of knowledge, skills, attitudes and experiences. A person is competent in an area of work if s/he has the knowledge, skills and attitudes that enable her or him to function at some minimum acceptable level (Lasonen, Shome & Burge 1994).

Discussing how one becomes an expert, Eteläpelto (1992) pointed out that theoretical studies or work experience alone does not make anybody an expert. Nor should the process be understood as a "one-dimensional quantitative process" where a person progresses automatically as his or her work experience increases. Eteläpelto (1992) defines the acquisition of expertise as a process that involves qualitative development and that is a consequence of experiential learning.

Virkkunen and Miettinen (1981) have specified professional qualifications as comprising individual capacities, knowledge and motivation; skills needed in specializing and in deepening one's theoretical and practical knowledge so as to meet the requirements of specific tasks; the ability to follow

scientific and technical development in one's occupational area, and to incorporate the innovations into one's personal working methods; the ability to move horizontally and vertically from one task to another in the same occupational area; the ability to plan and develop new working methods; and the ability to adopt new working methods in practice.

Becoming an expert requires the fostering not only of content-based knowledge but also of many different skills. There are many definitions of the objectives of higher education. The scheme known as Bloom's Taxonomy (Bloom 1956) has been widely used as an aid to defining objectives in higher education. It is probably more suitable for defining objectives in detail than for being used at the macro-design level. Carter (1985) has pointed out that many of its categories are too broad to be useful, while some topics have no place within the scheme. Bloom's model proceeds in hierarchical steps and emphasizes cognitive objectives.

Bloom categorized objectives into three overlapping domains according to learning outcomes: 1) Cognitive objectives (thinking), 2) Psychomotor objectives (doing), 3) Affective objectives (feeling). Bloom divides the cognitive domain further into six levels, from the simplest learning at level 1.00 to the most complex learning at level 6.00. His six levels are as follows: 1.00 knowledge, 2.00 comprehension, 3.00 application, 4.00 analysis, 5.00 synthesis and 6.00 evaluation. Bloom's Taxonomy of Educational Objectives is hierarchical, the higher or more complex levels of learning being based on knowledge obtained at the lower or simpler levels. One of the aims of teaching should be to encourage complex, higher-level thinking whenever possible, even with beginning students (Wells, Helsel & Trinklein 1986).

Ball (1985) divides educational skills into specific disciplinary or vocational skills on the one hand, and general (or 'transferable') skills on the other. General skills include, according to many sources, among others the following (e.g. Ball 1985; Bradshaw 1985; Bridges 1993; Carnevale et al. 1990; National Curriculum Council 1990; The Secretary's Commission on Achieving Necessary Skills 1992):

(a) communication skills (speaking, listening, reading, writing, knowledge of languages, computer skills, knowledge of communication technology)

(b) mathematical skills

(c) critical analytical thinking and problem-solving

(d) synthesizing, integrating, understanding wholes

(e) continuous learning

(f) social skills.

Meanings of the terms of competencies and qualifications used in the literature differ according to different research traditions. The concept of qualification has quite similar meaning in the Scandinavian and German tradition as the concept of competence has in the Anglo-American tradition. The concept of expertise originates from the cognitive psychology. In this study, an expert refers to a highly educated and experienced person.

Agricultural Education

According to Ollila (1986), Finnish agricultural education has emphasized transferring the knowledge of the various traditional agricultural disciplines. This is done in a didactic environment where most of the students' time is spent listening passively to lectures. This problem is not peculiar to Finland (see, for example Bawden 1991, 1992; Litzenberg and Schneider 1987; Wyllie 1991). By listening the lectures the graduates do not gain experience of analysis, synthesis or evaluation although real-life situations are complex and these skills are, accordingly, very necessary in working life. Ollila (1986) has asserted that because the agricultural higher education has been concentrating on transferring facts, the result has been graduates with insufficient academic skills. They have difficulties in analyzing, synthesizing and solving problems and for that reason they are not able to fully utilize the factual knowledge that they have acquired. Ollila (1986) added that many agricultural graduates have only passable academic skills and that they also lack such in-depth technical skills as are taught at vocational schools and colleges.

Virtanen (1991) says that the following factors can restrict the use of knowledge acquired at the university: the studies and the job do not match each other, the knowledge acquired at the university is out of date, the skills acquired at the university are not such as are needed in working life, the studies have been too theoretical. These problems are linked to an idea of knowledge where studies yield only ready-made information. The graduates might not have got the skills necessary for gathering information and analyzing and evaluating it. Such skills do not become obsolete. Ollila (1985a, 1986) has found these kinds of problem among agricultural graduates, too.

Learning can also be affective or experiential. This kind of learning is based on problem-solving. A good example of running a whole degree programme on a problem-based system is at the Faculty of Agriculture at the University of Western Sydney, where the hierarchical, discipline-based departmental format was replaced by a team-based management structure (Bawden 1991, 1992; Pearson and Ison 1992; Sriskandarajah 1991). The learning process is cyclic. Learning in groups is a strong characteristic of the programme. Learners are encouraged to find out about the problem situation they wish to improve. In the finding-out phase, they develop a rich picture of the situation in collaboration with the people involved. In the next stage - assimilation - they analyze the picture generated in order to draw patterns and themes and to gain insights into the problem. In the action-taking phase, learners converge toward concepts and generalization, and possible solutions to the problem. These solutions are then tested in the environment where the problem exists, and are accommodated to that setting (Sriskandarajah 1991).

The Problem

Finnish agricultural higher education has traditionally emphasized practical experience. Plant production studies contain a 30-week period of farm work and an 8-week period of research practice. Many students

come from farms and many have also studied at a vocational agricultural school before coming to the university. The knowledge they already have is beneficial in the sense that they can compare their earlier experiences to the factual knowledge they acquire at the university. On the other hand there is the possible disadvantage that the students may already have adopted traditional ways of thinking. Further, many students who want to come to the university may have unrealistic expectations about university studies. Ollila (1986) has found out that the motives of many of those wishing to enter the university are much better suited to the vocational school.

In Finland, plant production graduates have a strong practical background. The problem is that university education has not made much use of the students' practical experience as a source of learning. Their practical experiences have not been closely related to the university courses.

In Finland Ollila (1985a, 1985b, 1986) has earlier examined the relationship between the needs of the employers and the competencies of agricultural graduates. Ollila found that the graduates had problems with applying their theoretical knowledge to practice. The graduates admitted that they need better communication, language and computer skills. They wanted more effective student guidance. Generally the graduates said that there should be more courses of the kind that fosters problem-solving skills, and analytic and synthetic skills. Improving the teaching methods at the university was seen as the most important way to make studies more effective and improve the students' motivation.

According to Ollila (1985b, 1986) the employers, too, saw flaws in the graduates' problem-solving skills. In the employers' opinion the graduates were unable to achieve a holistic perspective. They wanted the graduates to be more creative, have better communication skills and good knowledge of languages as well as able to approach issues with a broader and more open mind.

Personal qualities are seen as very important in many working-life tasks (e.g. Butcher 1989; Carter 1985; Henkel 1990; Howard 1989; Howard, Litzenberg, Scheider and Fairnie 1990). In employers' opinion, the most important personal qualities are job motivation and attitude to work. The employers also rank highly creativity, flexibility, openness to new ideas and willingness to engage in lifelong learning. Traditionally the university has not perceived developing students' personal qualities as its task.

In Finland Ihamuotila (1986) recommended, among others, the following measures to improve agricultural higher education: (a) Switching in course contents from transferring knowledge to developing analytic and problem-solving skills; (b) Switching the emphasis in teaching from lecturing to more student-centered methods like group work, discussions, and essays; (c) Developing the teacher's pedagogical skills; (d) Taking pedagogical skills into consideration when selecting faculty members; (e) Encouraging the students to do their practice period abroad. There may be some differences between the views of faculty members and employers about the objectives of higher education. In Wyllie's (1991) opinion, teaching staff generally regard knowledge as the most important objective. According to Howard (1989), both academia and business agreed on the importance of communication skills. Business ranked personal qualities slightly higher than communication skills, but universities recognize that they can only screen for personal qualities, as opposed to the skills that they can enhance through education.

Scanlon and Pennock (1987) have found that while the faculty and agricultural graduates differ in their perceptions of the value of various competencies, they did not significantly disagree on what were important competencies. Eklund (1992) has pointed out that technical competence is not enough to an academic applicant in search of a job. Technical skills may be requisite to gain an applicant an interview, but personal qualities and communication skills will gain the position (Howard 1989). A professional employee is autonomous and self-directed at work and is able to learn and apply new things. Also, graduates should have not only a profound understanding of their own area but also wide academic skills. This has been the basis on which the contents of plant production education at the University of Helsinki have been developed in the 1990's.

Earlier studies have revealed a mismatch between the competencies of graduates in agriculture and the demands of employers. This study was designed to investigate to what extent employers, faculty members and graduates themselves differ in their assessment of plant production students' competencies. The study questions to be addressed were:

(1) How do the self-assessed competencies of plant production graduates differ from employer-assessed competencies?

(2) What competencies of plant production graduates are valued by faculty members?

Methods and Procedures

The research design was an exploratory field study and ex-post facto survey research. Data were gathered via a structured questionnaire. The responses of the plant production graduates, their employers and faculty members were analyzed by the frequencies, means, t-tests and correlation coefficients.

The items of the questionnaire, that was modified for three different groups, were designed to describe their background information and conceptions of workforce competencies. The items on competencies had five (1-5) response categories. The validity of the questionnaire was proved by submitting it to a panel of three judges who were faculty members in behavioral and agricultural sciences. The judges assessed the relevance of the items to determine respondents' conceptions of workforce competencies. Additionally, the questionnaire was pre-tested by five persons who did not represent the sample. As a result of judges' evaluation and pre-tests, the questionnaire was revised.

The persons included in this study were identified through purposive sampling from graduates, employers and univerisity teachers. The sample consisted of (1) all plant production graduates 1990 - 1993 in the Department of Agriculture and Forestry of the University of Helsinki except for those who are at present faculty members (a total of 68 graduates); (2) a small sample of employers (38) representing agricultural occupations; and (3) the faculty of the Division of Plant Production.

Data were collected in May - June 1994 as a mail inquiry. The questionnaires contained mostly structured questions and a few open-ended questions. Of the graduates 65 per cent (N = 40) returned the questionnaire. Among the 38 employers the return rate was 66 per cent (N = 25). Five faculty members

responded the questionnaire. The total number of sample was 70 persons.

The responses of the questionnaires were coded for statistical analyzing. The data gathered with the questionnaires were examined for means and frequencies and subjected to t-test and correlation coefficient calculations. The responses to the open-ended questions were analyzed qualitatively and summarized.

Findings

Description of the sample

Agricultural education in Finland is provided at vocational schools and colleges and at the University of Helsinki. Eligible for university education are those who have passed the matriculation examination at the end of the upper secondary school, or have a vocational education diploma. In the Department of Agriculture and Forestry of the University of Helsinki plant production is one of the major subjects. Some 85 - 90 agricultural students graduate per year, and approximately 20 per cent of them are plant production graduates. The graduates find work as advisors, school teachers, researchers and farmers, for example, or are employed in agribusiness.

The graduates' sample of this study comprised of 21 males (48%) and 23 females (52%). All respondents studied in the Division of Plant Production in the 1980s. Before admitted to the University the graduates got their diploma or certificate from the general upper secondary school, the upper vocational school, or from the agricultural college. More than a half of the graduates (57%) had a full-time job, and 18 per cent of them worked in their own farm. About 18 percent of the graduates were unemployed which corresponds to the average unemployment rate in Finland in 1994. Some graduates (7%) had a temporary job.

The employers of the graduates represented the private sector (44%) and the public sector (56%). Their areas of work were as follows: agribusiness, advisory work, education, research, and administration.

The five faculty members who responded to the questionnaire were the professors of the College of the Forestry and Agriculture in the University of Helsinki.

Students' self-assessment

Plant production graduates themselves estimated their content-based competencies as quite good. In their opinion, the most important generic abilities required in the workforce are good communication skills. Among the capabilities ranked highest were also positive work attitude, job motivation, confidence in one's own skills, self-assurance and teamwork skills (Table 1). In the graduates' opinion, less important of the

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Insert Table 1 here

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skills mentioned in the questionnaire were research skills. Many plant production graduates admit the need for better communication skills, knowledge of languages and computer skills. The greatest difference between the graduates' estimation of their own skills and their estimation of the needs of working life was in language

proficiency. On the other hand, there was a great variation in the perceived language skills between the plant production graduates, because a third of the graduates considered their knowledge of languages good. There was also some variation between men and women in this respect. Most male graduates appraised their languages and computer skills as insufficient. Most female graduates regard themselves as proficient in languages. On the other hand again, female graduates would like to have better negotiation management skills and be better able to see things in a holistic perspective.

In the graduates' opinion, when applying for a job most important were personal qualities, communication skills and work experience (Table 2). According to the unemployed graduates, the most

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important reason for their unemployment was the present difficult situation in Finnish labour markets. Insufficient work experience and insufficient knowledge of languages were also obstacles to getting a job.

When assessing the contents of their curriculum, most plant production graduates thought they had enough obligatory plant production courses in their curriculum. However, 18 per cent of the graduates believed that they would have needed more plant production courses.

No graduate thought that they had had too much statistics or computer skills to study. Also, in the graduates' opinion there should be more language studies in the curriculum. It was felt that the curriculum should include more studies aimed at developing scientific thinking and dealt with scientific methods. There was also a desire to get to know more about international agricultural affairs during the courses. Most graduates believed that they had just enough practical training in their studies. On the other hand, a third considered the period of practical training too long.

When asked about the quality of education, 82 per cent of the graduates thought that the university curriculum emphasized too much on transferring facts instead of imparting analytic and problem-solving skills. No graduate thought that problem-solving was stressed too much. However, there were too many lectures. The graduates would have liked to have more practical courses, teamwork and writing assignments. Most graduates considered the number of tests suitable. However, more than a third of the graduates said that there were too many tests; especially they criticized many tests on narrow subject areas, for they would prefer tests dealing with broader areas. The graduates also criticized the great number of short courses in their curriculum. They experienced it difficult to gain an overall view of their subject and its various subdivisions.

Opinions concerning the quality of the instruction varied very much. There were as many of those who were satisfied with the lectures (40 %) as of those who were not satisfied. Those who had started their studies last were most satisfied with the lectures. The graduates were also widely satisfied with the practical courses. On the other hand there was a general dissatisfaction with tutoring. Also, there were very varying opinions about the quality of the guidance available during the thesis-writing phase.

Many graduates who have a job are looking for another job. A fourth of the graduates think that their present job does not meet their expectations or their education. Many graduates also think their job has lower

requirements than their education. They also have problems with self-motivation. A notable observation is that a substantial number the plant production graduates want to work in the future as farmers. However, the agricultural higher education is not directly concerned with the distribution of such qualifications as are necessary for a farmer.

Employers' Evaluation

Another group studied were agricultural employers. As the most important factor when choosing new employees they consider the applicant's personal qualities (Table 3). Those engaged in agribusiness in

Insert Table 3 here

particular saw personal qualities as extremely important. Communication skills and knowledge of languages were ranked next. Employers working in the private sector valued work experience a little more than public-sector employers. Other characteristics taken into account when recruiting new employees included flexibility, initiative and development potential.

The qualifications ranked highest by the employers (Table 4) were such personal qualities as positive

Insert Table 4 here

work attitude, self-motivation, autonomous working skills and self-confidence. Communication skills including speaking and writing in three languages together with problem-solving and analytic skills were also considered very important. Aspiring to continuous learning is also highly desirable as is teamwork and the ability to solve marketing problems.

The employers agree with the plant production graduates that the graduates' content-based knowledge is quite good (Table 5). In the employers' opinion the graduates are also fairly competent in languages and in

Insert Table 5 here

mathematics and statistical skills. Further, the graduates are good at farm work. The employers wanted the graduates to have better communication skills and more self-confidence as well as better ability to work independently. Critical thinking and problem-solving skills were also very much appreciated. The workforce competencies prized by employers were more comprehensive than the formal qualifications delivered by higher education.

The faculty members' assessment

The faculty members regard knowledge as very important but they also realize the importance of many other skills needed in the workforce (Table 6). According to faculty members, the graduates' academic skills

Insert Table 6 here

and basic scientific knowledge do not quite achieve the desired objectives. The teaching staff thought that the objectives of higher education transcend a narrow range of disciplinary knowledge. They also judge that the university has good chances of achieving its proper academic objectives through developing its learning system.

The faculty members' opinions of the competencies needed in working life and of the objectives of the curriculum were somewhat different from those of the graduates and the employers. The differences were clear in attitudes to a scientific emphasis, postgraduate studies and the extent of the studies. The faculty members appreciated scientific knowledge and post-graduate studies more than do the other groups. On the other hand the faculty did not consider it very important that the graduates master farm work, have a good grasp of economics and possess marketing skills. Opinions concerning the importance of academic skills did not differ between faculty members, graduates and employers.

Conclusions and Discussions

The variety of the graduates' answers was quite large, which suggest that they had thought over every question. However, it is worth asking why the graduates almost regularly assessed their own competencies as lower than what is, in their opinion, needed in the workforce. Naturally such opinions can often stem from real disparities between perceived skills and requirements. It is also possible that such perceived disparities reflect a cultural tendency to underrate one's own skills. Also, a lack of self-confidence can lead students to underrate their competencies and doubt their abilities.

The findings of this study reveal that the problem areas in agricultural higher education in Finland were almost the same as ten years ago (Ollila 1985, 1986). The problems of Finnish agricultural higher education do not differ from those besetting other academic subjects or agricultural education in other countries. Ihamuotila (1986) recommended that the university curriculum should place greater emphasis on analysis and problem-solving instead of transferring facts and rote learning. Of the graduates examined here most had done a major part of their studies before 1991. The present findings suggest that at that date Ihamuotila's (1986) recommendations were yet to be carried out in large-scale agricultural higher education.

The instructional emphasis still lay on lecturing and on transferring facts. Both graduates, employers and faculty members agreed that the emphasis should be shifted from teaching facts to developing the qualifications that give students versatile means to deal with new situations in working life. Also, these skills should enable students to engage in lifelong learning and to apply new knowledge and methods in practice.

This kind of shift in emphasis would also lead to more in-depth studies which corresponds to a real need expressed the plant production graduates. Some of them felt that their plant production studies had not been comprehensive enough. Many graduates also wanted to acquire better research skills.

Employers, faculty members and graduates all agreed that the graduates' content-based knowledge of plant production is quite good. The graduates also master farm work quite well. On the other hand, in the employers' opinion more stress should be placed on grasping farm systems as an integrated whole and on understanding societal systems and agriculture as a part of it. The graduates and faculty members did not rank these skills as high. In most work tasks it is not exactly farmworking skills that the graduates need. Rather, they need an understanding of the circumstances under which farms and the countryside exist and of how the decisions made by the government and others affect the farms. In Finland many plant production students have links with the countryside through their home farm. It should be considered how these farming connections could better be utilized in student learning.

There has been discussion about the need of a scientific emphasis in agricultural higher education. Plant production is an interdisciplinary domain. In the labour markets the graduates work in many different tasks. Some are employed in jobs where a solid scientific background is necessary. Others again have jobs where qualifications in many areas are important. On the other hand many observations (e.g. Bradshaw 1985; Slee 1989; Snetsinger 1992; Summers 1992; Virtanen 1991) do support the finding that the graduates need a thorough grounding in their own field, and a grounding that is not dependent on present production technology. Mastering one area thoroughly makes it easier to broaden one's skills to encompass new areas. It will also increase confidence in one's own skills. Both the employers and the graduates thought that a basic knowledge of economics and marketing is necessary in many jobs. Some graduates said that in their estimate, economic subjects are more important than plant production when they are looking for a job. However, the faculty members rated the objectives of acquiring marketing skills the lowest.

Computer skills are nowadays necessary in all occupational areas. However, almost 80 per cent of the graduates felt that they had not acquired sufficient computer skills. They also criticized the quality of computer education. Computer technology is changing so fast that the university's resources for meeting the needs of thousands of students are limited. On the other hand, more and more students have a personal computer. The big differences in the graduates' computer skills depend in large part on how much they are themselves interested in computers.

The problems hampering agricultural graduates' communication skills have been known for a long time in Finland. One reason to neglecting the promotion of communication skills is that the students do not realize how important such skills are in working life. Also, developing these particular skills has been an optional aspect of studies. The university has not traditionally seen fostering the students' communications skills as one of its tasks.

This study reveals that there are great differences between the graduates' knowledge of languages. One reason for the great variation is that some of the graduates have been working in foreign countries during their studies. Female graduates were more proficient in languages than male graduates and the reason for that

could partly be women's greater interest in engaging in optional language studies. More attention should be paid to language skills during university studies because most of the graduates are not proficient in languages as compared with the needs of working life. In Finland the graduates often need to be able to speak and write in three languages. Improving the students' knowledge of languages would also make them better qualified for international tasks.

In the light of the findings of this study, the plant production curriculum did not give the graduates adequate research capabilities. On the other hand, most graduates did not regard such qualifications as especially important. However, most graduates thought that their curriculum should have included more studies concerned with scientific thinking and scientific methods. The faculty members, too, were conscious of this problem.

Teamwork skills, social skills and negotiation skills were considered necessary in working life. The university has traditionally emphasized individual effort rather than team work. Moreover, universities have not been considered very good at effecting these particular qualifications. However, the graduates did need better qualifications especially in negotiation and management skills. In this respect we could follow Bawden's (1991, 1992) views of learning as an interaction between society and the individual where the students, at the same time as they acquire vocational skills, develop many other abilities, e.g. social skills and communication skills.

Most teachers of plant production at the university do not have any great experience of other than research work and this is reflected in their answers. The teachers are naturally bound up with their own experiences, and the objectives important to a research career can easily be emphasized. On the other hand the faculty members are conscious of the many problem areas in the graduates' competencies. They have a realistic conception of their students' competencies, realizing that students' academic skills and basic scientific knowledge do not quite achieve the desired objectives. The faculty has obviously wanted to set more ambitious goals for plant production education. They also considered essential to differentiate the educational objectives of the university from those of the vocational school. The findings of this study do not suggest so, as many graduates admitted that their competencies were insufficient in many of those areas where the faculty members, too, saw a need for improvement.

Working life needs versatile competencies and many kinds of skills. The formal qualifications delivered by higher education are usually narrower than that. This is a usual conflict in many educational areas. It is also a constructive conflict: it is unthinkable that the present needs of working life could directly determine university curriculum. It is the university's duty to build a future perspective and to make decisions that also take into account future needs. However, when planning the curriculum the faculty should also listen to the employers' views so that its graduates will be desirable employees.

This study shows that the most important qualifications affecting employers' choice of new employees are the candidates' personal qualities, e.g. positive work attitude, good motivation, confidence in one's own skills and the ability to work individually. Communication skills are ranked high, too. These findings support Howard's (1989) views.

Public-sector employees consider educational factors more important than private-sector employees, as Turkulainen (1986), too, has found out. The discovery that previous work experience is not seen as important as personal qualities and communication skills supports the findings of Howard et al. (1990). We may assume that an applicant's work experience is an important but not the most important factor.

A clear difference between the graduates on the one hand, and faculty members and employers on the other, was in perceived ability to work independently. Most graduates thought that their independent working ability was fairly good. The employers and faculty members, by contrast, considered the graduates' independent working skills no better than fair. The reason for this divergence in opinion might be that the students think that working independently consists of doing one's assignments. In the workforce, however, independent working means initiative, self-confidence, creativeness and decision-making.

Unemployment and difficulties in getting a suitable job will affect job motivation. One out of six graduates thought that their job motivation was not good. Also, some graduates were not fully assured of their own skills and had problems with self-confidence. Insufficient theoretical skills could have caused difficulties in applying learned facts in practice as Ollila (1985a, 1986) and Virtanen (1991) have also found out. It seems likely that the graduates possess an abundance of unconnected factual information but not enough skills to be able to engage in continuing learning and problem solving.

The agricultural sector is shrinking in Finland. It will force many agronomists to change their traditional way of thinking and look for new unconventional employment opportunities in the countryside. Many plant production graduates have already realized that in the future there will not be as many secure careers or permanent jobs as previously. Compared to the earlier situation (Ollila 1985a) there is a definite difference in the graduates' way of thinking: right now as many as a fourth of the graduates think that they could employ themselves in an enterprise of their own other than a farm. Internationalizing and closer contacts to other countries have also increased interest to working abroad.

A substantial number of the graduates wants to work as a full-time or a part-time farmer in the future. Here there is some conflict between the goals of the university and these graduates' goals: the aim of the agricultural higher education is not to educate farmers. Accordingly, the faculty members' and many graduates' educational objectives are not always identical, another possible cause of motivation problems during the studies.

The findings of our study suggest a conception of the plant production expert that parallels the views expressed in previous research (e.g. Bawden 1991, 1992, Howard et al. 1990, Ollila 1986 and Sriskandarajah 1991). A positive attitude to one's work and strong motivation are the crucial qualifications in the workforce. A willingness to engage in continuing learning and the ability to apply new information in practice are appreciated very much as are academic qualities that enable a graduate to cope with unforeseen challenges arising in the future. Communication skills as well as social skills are also very important in working life. The faculty members see postgraduate studies as important but the graduates and employers do not rank these as high, a fact already noted by Howard et al. (1990).

Implications

The Department of Agriculture and Forestry of the University of Helsinki bears a substantial responsibility for developing Finland's agriculture being the only institution for agricultural university education in the country. The faculty educates a remarkable number of those working at important posts in the agricultural sector. Accordingly, it is crucial that the agricultural curriculum is evaluated continuously and that the faculty is ready to respond to changing needs. Agricultural graduates should have such qualifications and skills that they are able to develop the agricultural sector as well as to compete for jobs with other graduates in Finland and on international labour markets. The present findings raise following implications for the consideration of those concerned with the improvement of occupational higher education.

An important starting point are strongly motivated students. As it was found in earlier studies, the goals of some agricultural students at the university are better suited to upper secondary school studies. This conflict can cause motivation problems and dissatisfaction with university studies. Upper secondary school students should be given more information about studying at the university and about the objectives of higher occupational agricultural education. It would enable them to decide whether these objectives match with their own goals and expectations. Thus the students would know in advance whether the university really is the right place for them or whether the agricultural school or a higher occupational institute would suit them better.

The development and evaluation of teaching methods and teachers' pedagogical skills is important. Much more attention should also be paid to student guidance. This study reveals, as many other studies have already done, that instead of lectures the students want more student-centered educational methods. The emphasis should lie not on drumming into the students a large number of technical facts but on creating a lifetime learner by concentrating on skills like analysis, problem-solving and holistic thinking. A further crucial way to improve student self-motivation is to improve the teaching methods.

The faculty members are responsible for improving both the students' content-based knowledge and their academic skills. The findings of this study reveal that in the opinion of the faculty the university has a good chance of achieving its proper academic objectives through developing its learning systems.

The study revealed that the students' communication skills should be improved. Communication skills also include speaking and writing in three languages. A good method to improve the graduates' language proficiency is to encourage the students to do their practical training abroad. The students' languages skills need to be both maintained and developed further in the course of their studies. This is the concern of faculty members, too.

In Finland, traditionally university studies have improved rather passive than active language skills. The students' speaking and writing skills in English, Swedish, German and French can also be improved by integrating plant production studies with language studies. In addition to Finnish language, that is the native language, some classes of plant production has been taught in English. If the only possibility to speak English during one's studies is a short English course in the first university year, the graduates do not feel proficient

in English language. The proficiency in foreign languages crucially affects graduates' chances of working in international tasks or getting a job abroad.

When appraising the proper degree of scientific emphasis, faculty members might estimate what is the level of basic scientific knowledge that the graduates should have and what skills are not necessary until at the postgraduate level. This study showed that the plant production graduates' basic scientific knowledge does not quite achieve the objectives desired by the faculty. A means of gaining the objectives is to ensure that the students are well motivated. Developing the teaching methods is an effective way to improve the graduates' qualifications and their level of expertise.

The plant production curriculum at its best would include a series of educational experiences that could develop the students' way of thinking and processing information. The aim is to educate agronomists who have high confidence in their own skills and are highly qualified to find new information and learn new topics quickly. In addition, they are self-directed in their work. Applying some ideas from experiential learning in plant production education might improve the graduates' skills in many areas where our study revealed deficiencies.

The many changes carried out in plant production education in the 1990's do not show in this study yet. However, even now it can be asserted that the course chosen in plant production education has a relevant direction. Many problems observed in this study have already been noticed and partly corrected. For example, there are less lectures and more teamwork and individual assignments. The curriculum consists of a greater number of integrated wholes instead of many short courses and unconnected facts. The last few years have seen more postgraduate degrees in plant production than ever before. There is more research being done, too. Further, the international links of the department have also notably increased. At present 20 per cent of plant production education is given in English. The number of foreign students has increased - of all students at the Division of Plant Production at the University of Helsinki about 20 per cent are foreigners. The department is constantly taking part in many international projects. At the same time as the department is becoming more international its Finnish students, too, are gaining experience from international cooperation and have good opportunities to practise their language skills.

The upgrading of plant production teachers' pedagogic skills and evaluating the teaching methods have begun. At the same time the new curriculum including solid scientific groundwork will also strengthen the students' problem-solving skills and analytic skills as well as their communication skills and social skills. In a few years' time we will be able to see how the remodelling of the curriculum will change the plant production graduates' workforce competencies.

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TABLE 1. Means of factors influencing chances of getting a job as perceived by the graduates (1 = not important; 5 = very important)

Factor	x	s	N
Personal qualities	3.81	1.17	40
Communication skills	3.28	1.23	40
Earlier work experience	3.16	1.44	40
Knowledge of languages	2.83	1.44	40
Other subjects	2.39	1.29	40
Major subject	2.28	1.32	40
The topic of the thesis	2.08	1.36	40
Sex	1.92	1.23	40

TABLE 2.

Means of skills perceived as necessary in the workforce by plant production graduates and the graduates' self-assessed competencies (1= not important/own skills not good; 5= needed very much/own skills very good) (N=40)

Competence	Necessary skills		Own skills	
	x	s	x	s
Communication skills, speaking	4.74	.49	3.49	.86
Work motivation	4.58	.59	4.23	.81
Positive work attitude	4.58	.59	4.26	.69
Independent working skills	4.63	.54	4.33	.65
Confidence in own skills	4.56	.55	4.05	.90
Communication skills, writing	4.42	.66	3.86	.68
Teamwork skills	4.51	.67	4.00	.85
Negotiation skills	4.42	.70	3.42	.82
Holistic thinking	4.37	.72	3.74	.66
Computer skills	4.30	.71	2.95	.97
Knowledge in languages	4.23	.72	2.84	1.13
Management skills	4.05	.87	3.16	.90
Critical thinking	4.00	.85	3.56	.88
Problem-solving skills	3.98	.91	3.19	.70
High moral/ethical values	3.74	.90	4.02	.94
Research skills	3.19	1.07	2.77	.95

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TABLE 3. Means of factors influencing chances of getting a job as perceived by the employers (1 = not important; 5 = very important)

Factor	x	s	N
Personal qualities	4.70	.47	25
Communication skills	4.26	.54	25
Knowledge of languages	4.13	.76	25
Major subject	3.74	.86	25
Earlier work experience	3.26	.81	25
Other subjects	2.43	.99	25
The topic of the thesis	2.13	.97	25
Sex 1.48	.99	25	

TABLE 4. Means and standard deviations of skills perceived as necessary in the workforce by the employers and the employers' assessment of the plant production graduates' competencies (1= not important/graduates' skills not good; 5= very important/graduates' skills very good) (N=25)

Skills	Necessary skills		Skills possessed by the graduates	
	x	s	x	s
Knowledge of plant production	4.25	.79	3.67	.86
Marketing skills	4.00	.89	2.33	.86
Knowledge of farming	4.00	.85	3.19	.81
Computer skills	4.00	.63	3.05	.86
Understanding the relationship between agriculture and the rest of society	3.86	.91	2.52	1.08
Capability for international tasks	3.81	.93	3.10	1.09
Basic scientific knowledge	3.60	1.10	3.45	.76
Knowledge of other agricultural sectors	3.55	.76	3.10	1.00
Mathematical and statistical skills	3.10	.79	3.16	.83
Practical farmworking skills	2.95	1.23	3.25	.79

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TABLE 5. Means and standard deviations of general skills perceived as necessary in the workforce by the employers and the employers' assessment of plant production graduates' competencies (N=25)

Skills	Necessary skills		Skills possessed by the graduates		Difference
	x	s	x	s	
Positive work attitude	4.82	.39	3.67	.66	1.15
Self-motivation	4.82	.39	3.95	.86	.87
Independent working skills	4.68	.48	3.14	.96	1.54
Communication skills, speaking	4.63	.58	2.81	.81	1.83
Self-confidence	4.59	.59	3.14	.73	1.45
Willingness to change and develop oneself	4.61	.50	3.45	.86	1.16
Communication skills, writing	4.50	.67	3.29	.64	1.21
Teamwork skills	4.50	.51	3.62	.74	.88
Holistic thinking	4.45	.67	3.10	.62	1.35
Confidence in one's own skills	4.23	.61	3.00	.95	1.23
Critical thinking	4.23	.61	3.19	.87	1.04
Knowledge of languages	4.09	.87	3.29	.96	.80
Creativity	4.00	.82	3.14	.65	.86
High moral/ethical values	3.96	1.02	3.41	.67	.55
Analytical problem-solving	3.95	.72	3.05	.80	.90

TABLE 6. Means of the faculty members' educational objectives and their opinions of the graduates' competencies. (1= not important/ graduates' competencies poor; 5= very important/graduates' competencies very good) (N=5)

Competences	Aim level	Graduates' level
Knowledge of plant production	4.80	4.40
Knowledge of other agricultural areas	2.80	3.20
Practical knowledge of farming	3.00	3.40
Practical farmworking skills	2.00	3.80
Basic scientific knowledge	4.80	4.80
Mathematical and statistical knowledge	3.60	2.60
Computer skills	3.40	2.80
Understanding the relationship between agriculture and the rest of society	3.80	3.00
Marketing skills	2.40	2.20
Capability for international tasks	3.80	2.20
Communication skills, speaking	4.40	3.20
Communication skills, writing	4.40	3.20
Knowledge of languages	4.40	2.60
Analyzing and problem solving skills	4.80	2.80
Holistic thinking	5.00	2.60
Critical thinking and evaluating	4.80	2.80
Teamwork skills	4.20	3.00
Negotiation skills	3.80	3.20
Management skills	3.60	3.20
Independent working skills	4.60	3.40
Research skills	4.40	2.60
High moral/ethical values	4.40	3.40
Positive work attitude	4.40	3.60
Motivation	4.80	3.40
Confidence in own skills	4.80	3.60